Exhibit 13

Exponent®
Engineering & Scientific Consulting

Jeffrey Wishart, Ph.D.
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Professional Profile

Dr. Jeffrey Wishart specializes in advanced vehicle technologies and energy systems, with a diverse background in high-energy physics. His experience spans the automotive industry and academia having collaborated with private entities, government agencies, utilities, and leading multi-million-dollar research initiatives. Dr. Wishart has experience in the powertrain design process, from virtual prototyping using modeling, simulation, and mathematical optimization, to design validation and Design Failure Mode and Effect Analysis (DFMEA). His validation and testing experience includes; component- and vehicle-level testing, chassis, and engine dynamometer testing; closed track and public road testing, including performance and durability testing; and real-world driving emissions testing. As Chair of the Society of Automotive Engineers (SAE) Verification and Validation (V&V) Task Force under the On-Road Automated Driving (ORAD) Committee, Dr. Wishart is leading an effort to develop standards that include safety principles and testing methodologies to ensure that vehicles equipped with automated driving systems (ADSs) are safe to be driven on public roads.

In addition to his position at Exponent, Dr. Wishart holds the position of Adjunct Professor at Arizona State University (ASU) in the Automotive Systems department, after previously being a full-time faculty member. In this academic capacity, he is engaged in cutting-edge research and development (R&D) in ADSs from both a safety and energy efficiency perspective, cooperative platooning of heavy-duty vehicles, hydrogen storage technologies for fuel cell vehicles (FCVs), extreme fast charging of electric vehicles (EVs), and disabling wrong-way-driving vehicles. Dr. Wishart's R&D experience includes advanced powertrain technologies — including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), EVs, and FCVs — as well as fuel consumption-reduction technologies and EV charging infrastructure.

Prior to joining Exponent and ASU, Dr. Wishart was a Staff Engineer at the Intertek Center for Evaluation of Clean Energy Technology (CECET). In this role, he was the technical lead for the vehicle and infrastructure engineering team focused on testing and research of advanced powertrain and infrastructure technologies, with a Department of Energy (DOE) grant of $33M for the Advanced Vehicle Testing and Evaluation (AVTE) program. As Quality Manager for the Phoenix, AZ facility, Dr. Wishart led the effort to secure International Organization for Standardization (ISO) 17025 accreditation.

Before joining Intertek, Dr. Wishart was a Senior Principal Engineer at ECOtality, where he was the technical lead on the precursor to the aforementioned AVTE program, the Advanced Vehicle Testing Activity (AVTA), with a focus on emerging energy technologies such as vehicle-to-grid (V2G) and advanced-chemistry batteries. He was also a Project Manager on the $212M, DOE-funded "The EV Project", the largest deployment of electric vehicle supply equipment (EVSE) in the world at the time (2010-2013). As part of this project, the Blink brand line of EVSE was developed and commercialized. It was the first EVSE to achieve safety compliance listing from Underwriters Laboratory (UL), and also the first to include a touchscreen, a utility-grade meter, and be networked. Dr. Wishart led the effort to

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achieve Federal Communications Commission (FCC) certification for the Blink products that have both wireless and cellular communication capabilities. Additionally, he wrote white papers on the project findings on topics that ranged from discussion of demand charges to greenhouse gas emissions avoidance.

Dr. Wishart has worked internationally in various energy systems positions. In Canada, he worked at Powertech Labs and Flowserve in the transportation and oil and gas (O&G) industries, respectively. In Australia, Dr. Wishart worked at the Queensland utility, Ergon Energy, in several capacities relating to asset management and emerging transportation technologies.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Victoria—Institute for Integrated Energy Systems (IESVic), Canada, 2008

M.Sc., Engineering Physics, University of Saskatchewan—Canadian Light Source (CLS), Canada, 2001

B.Sc., Engineering Physics, University of British Columbia, 1998

Academic Appointments

Adjunct Professor, Automotive Systems in Engineering, Arizona State University, 2018-Present

Clinical Assistant Professor, Automotive Systems in Engineering, Arizona State University, 2016-2018

Prior Experience

Adjunct Professor, Arizona State University, 2018-Present

Clinical Assistant Professor, Arizona State University, 2016-2018

Consulting Engineer, Powertech Labs, 2017-2018

Staff Engineer, Intertek, 2013-2016

Senior Principal Engineer, ECOtality, 2009-2013

Senior Project Engineer, Ergon Energy, 2008-2009

Consulting Engineer, University of Victoria, 2007-2008

Consulting Engineer, Greenleaf Integrated Energy Systems, 2007-2008

Project Manager, Ergon Energy, 2002-2005

Professional Affiliations

Chair, Society of Automotive Engineers On-Road Automated Driving (ORAD) Committee — Validation and Verification Task Force, 2016-Present

Member, Society of Automotive Engineers On-Road Automated Driving (ORAD) Committee, 2016-Present

Member, Society of Automotive Engineers Hybrid Communication and Interoperability Task Force, 2013-

Present

Member, Society of Automotive Engineers Wireless Charging Task Force, 2013-Present

Member, Society of Automotive Engineers Hydrogen Fuel Cell Vehicle Crash Testing Safety Guidelines, 2013-Present

Member, Society of Automotive Engineers Hybrid J1711 Terminology Task Force, 2008-2012

Member, EPRI Infrastructure Working Council, 2015-Present

Languages

French

Publications

Journal Articles

Carlson R, Wishart J, Stutenberg K. On-road and dynamometer evaluation of vehicle auxiliary loads. SAE International Journal of Fuels and Lubricants, April 2016; 9(1):260-268.

Wishart J, Carlson R, Chambon P, Gray T. Testing of close-to-commercialization energy storage devices takes to the road. SAE Automotive Engineering International, March 2013.

Secanell M, Wishart J, Dobson P. Computational design and optimization of fuel cells and fuel cell systems: A review. Journal of Power Sources, April 2011; 196(8):3690-3704.

Wishart J, Secanell M, Zhou Y. Hybrid vehicle nomenclature and plug-in hybrid vehicle fuel economy. International Journal of Electric and Hybrid Vehicles, June 2010; 2(3):177-201.

Wishart J, Zhou Y, Dong Z. Review of multi-regime hybrid vehicle powertrain architecture. International Journal of Electric and Hybrid Vehicles, August 2008; 1(3):248-275.

Wishart J, Zhou Y, Firmani F, Dong Z. Dynamic modelling and simulation of a multi-regime hybrid vehicle powertrain architecture. International Journal of Electric and Hybrid Vehicles, April 2008; 1(2):188-219.

Wishart J, Dong Z, Secanell M. Optimization of a PEM Fuel Cell System Based on Empirical Data and a Generalized Electrochemical Semi-Empirical Model. Journal of Power Sources, October 2006; 162(2):1041-1055.

Hirose A, Wishart J. On Transition Radiation. Canadian Journal of Physics, October 2001; 78(11):997-1003.

Conference Articles

McPhail D, Wishart J, Ingram D. Utilizing an Aggregated Network of Electric Vehicle Supply Equipment to Provide Demand Response to the Electricity Grid. Australasian Universities Power Engineering Conference, Paper AUPEC-2016-17, Brisbane, Australia, September 2016.

Carlson R, Wishart J, Stutenberg K. On-road and dynamometer evaluation of vehicle auxiliary loads. SAE World Congress, Paper 2016-01-0901, Detroit, USA, April 2016.

Shirk M, Wishart J. Effects of electric vehicle fast charging on battery life and vehicle performance. SAE

World Congress, Paper 2015-01-1190, Detroit, USA, April 2015.

Wishart J, Carlson R, Chambon P, Gray T. The Electric Drive Advanced Battery (EDAB) Project: Development and utilization of an on-road energy storage system testbed. SAE World Congress, Paper 2013-01-1533, Detroit, USA, March 2013.

Wishart J, Shirk M, Gray T, Fengler N. Quantifying the effects of idle-stop systems on fuel economy of light-duty passenger vehicles. SAE World Congress, Paper 2012-01-0719, Detroit, USA, April 2012.

Zhou Y, Younis A, Dong Z, Wishart J. Optimization of control strategy and key components of a two-mode hybrid vehicle. 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, Canada, September 2008.

Wishart J, Zhou Y, Dong Z. Review, modelling, and simulation of two-mode hybrid vehicle architecture. ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Las Vegas, USA, September 2007.

Wishart J, Dong Z, Secanell Z. Optimization of a PEM fuel cell system for low-speed hybrid electric vehicles. ASME 2006 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Philadelphia, USA, September 2006.

Wishart J, Dong Z, Secanell M. Optimization of a fuel cell system based on empirical data of a PEM fuel cell stack and the generalized electrochemical model. 1st International Green Energy Conference, Waterloo, Canada, June 2005.

Dissertations and Theses

Wishart J. Modeling, Simulating, Testing, and Optimization of Advanced Hybrid Vehicle Powertrains. Ph.D. Dissertation, University of Victoria — Institute for Integrated Energy Systems (IESVic), April 2008.

Wishart J. Transition Radiation Monitors at the Canadian Light Source. M.Sc. Thesis, University of Saskatchewan — Canadian Light Source, October 2001.

Magazines, White Papers, and Public Reports

Wishart J. The Refueling Wars: A Comparison of Gasoline, Electric, and Fuel Cell Vehicles. FleetCarma White Paper, November 2017.

Francfort J, Benett B, Carlson R, Garetson T, Gourley L, Karner D, Kirkpatrick M, McGuire P, Scoffield D, Shirk M, Salisbury S, Schey S, Smart J, White S, Wishart J. Plug-in Electric Vehicle and Infrastructure Analysis. Advanced Vehicle Testing Activity (AVTA) Report, September 2015.

Wishart J. AVTE Interoperability Project: Phase 1: Conductive Charging. Advanced Vehicle Testing Activity (AVTA) Report, June 2015.

Wishart J. Fuel Cells vs. Batteries in the Automotive Sector. Intertek White Paper, August 2014.

Wishart J. Intertek: Helping Manufacturers Meet the 2025 CAFE Regulations. Intertek White Paper, March 2014.

Wishart J. An Efficient Future: The Effects of Fuel Economy and Emissions Regulations on the Automotive Sector. Charged EVs Magazine, February 2014.

Wishart J. Fuel Cells vs. Batteries. Charged EVs Magazine, December 2013.

Wishart J. Demand Charges & EVSE. Charged EVs Magazine, October 2013.

Wishart J. Lessons Learned - Greenhouse Gas (GHG) Avoidance and Fuel Cost Reduction. The EV Project White Paper, June 2012.

Wishart J. Lessons Learned - DC Fast Charge - Demand Reduction. The EV Project White Paper, May 2012.

Wishart J, Francfort J. The Development of a Charge Protocal to Take Advantage of Off- and On-Peak Demand Economics at Facilities. Advanced Vehicle Testing Activity (AVTA) Report, February 2015.

Morrow K, Hochard D, Wishart J. Vehicle to Electric Vehicle Supply Equipment Smart Grid Communications Interface Research and Testing Report. Advanced Vehicle Testing Activity (AVTA) Report, September 2011.

Presentations

Wishart J. Evolving V&V to Support an Automated Future. SAE From ADAS to Automated Driving Conference, Detroit, USA, October 2018.

Wishart J. AVTE Interoperability Project: Phase 1. EV2016VÉ Conference, Montreal, Canada, July 2016.

Wishart J. Intertek CECET Vehicle Testing Activities for the U.S. Department of Energy. SAE Arizona Chapter Monthly Meeting, Phoenix, USA, April 2016.

Wishart J. Fast-Charge Effects on Battery Life and Vehicle Performance. EV2014VÉ Conference, Vancouver, Canada, October 2014.

Wishart J. "Advanced Powertrains: Current Industry Status. SAE Arizona Chapter Monthly Meeting, Phoenix, USA, August 2013.

Wishart J. Electric Drive Advanced Battery Testbed. SAE World Congress, Detroit, USA, April 2013.

Wishart J. Quantifying the Effects of Idle-Stop Systems on Fuel Economy in Light-Duty Passenger Vehicles. SAE World Congress, Detroit, USA, April 2012.

Wishart J. The EV Project: Description and Status. EV2012VÉ Conference, Montreal, Canada, October 2012.

Wishart J. The Future of Vehicle Propulsion. Rotary Club, Saanich Chapter, Victoria, Canada, June 2007.

Wishart J. EVs vs. FCVs. British Columbia Sustainable Energy Association, Victoria, Canada, February 2007.

Wishart J. Review, modelling, and simulation of two-mode hybrid vehicle architecture. ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Las Vegas, USA, September 2007.

Wishart J. UVic's Shell Eco-Marathon Entry. All Points West, CBC Radio, Victoria, Canada, November 2006.

Wishart J. Optimization of a PEM fuel cell system for low-speed hybrid electric vehicles. ASME 2006 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Philadelphia, USA, September 2006.

Wishart J. Optimization of a FCS Based on Empirical Data and Semi-Empirical Model. International Green Energy Conference, Waterloo, Canada, June 2005.

Wishart J. Fuel Cell System Modeling at the University of Victoria. Institute for Fuel Cell Innovation (IFCI), Vancouver, Canada, July 2005.

Project Experience

Principal Investigator on a DOE-funded project to optimize the energy efficiency of an EV, where the application is a shuttle bus with four in-wheel electric hub motors. The optimization includes low-level, powertrain control, V2X communications and look-ahead information from topographical maps, neighboring vehicles, and intersection managers to reduce fuel consumption.

Technical lead on a project to test fuel economy and aerodynamic effects of platooning heavy-duty vehicles equipped with cooperative, adaptive cruise control (CACC) technology.

Co-managed (as a faculty advisor) an Advanced Technology Vehicle Competition (AVTC) in which the students designed a new plug-in hybrid powertrain for a performance light-duty vehicle. The program took place over 4 years and served as a pre-employment training program for a variety of automotive OEMs.

Managed a project to evaluate the effects of charging rates on battery degradation and vehicle performance in EVs. EVs were driven to full depletion and subsequently charged twice per day, with some receiving Level 2 charge rates and the others receiving direct current fast charging (DCFC) charge rates. The results showed that faster charging rates had a lower impact on battery degradation than hypothesized.

Managed a project to assess the industry-wide interoperability of EVs and EVSE. Both automotive and infrastructure OEMs provided test products, and a round-robin testing program was conducted, with the results helping the OEMs determine whether their products were market ready.

Managed a research project to uncover the cause of failure of a utility's wooden power poles in Queensland, Australia. Failure analysis, technological solutions to non-destructive testing, and asset management practice updates were conducted.

Managed the powertrain team on a project involving the design, construction and testing of a fuel cell-ultracapacitor hybrid vehicle for an AVTC where fuel consumption minimization was the objective.

Editorships & Editorial Review Boards

Session Chair, SAE Powertrain, Fuels, & Lubricants Conference, 2017-Present

Peer Reviewer

Reviewer for Department of Energy (DOE) Annual Merit Review (AMR), 2013-Present

Reviewer for SAE International Journal, 2009-Present

Reviewer for Journal of Power Sources, 2009-Present

Reviewer for Journal of Automobile Engineering, 2009-Present

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Professional Profile

Dr. Lillo specializes in the analysis of thermal and fire phenomena and vehicle issues. His professional background is in mechanical engineering and automotive technology. He investigates mechanical and thermal failures, claims of defect and issues of liability involving automobiles, trucks, buses, ATV's, and watercraft. He has experience investigating the cause, origin and progression of fires, explosions, and other thermal events in a variety of environments including residential and commercial structures, vehicles and machinery.

Dr. Lillo carries out work relating to combustion, fluid flow, thermodynamic and heat transfer processes. He performs engineering analysis of power producing devices such as engines and turbines, as well as appliances, gas utilities and pipelines, consumer devices, hydraulic and pneumatic systems, boilers, and heating/cooling systems. Dr. Lillo has extensive experience designing and performing scientific tests, measurements and research. He has published peer-reviewed articles on the topics of engines, combustion strategies, fuel sprays, ignition processes and mechanical and optical diagnostics.

Dr. Lillo is trained in the field of automotive repair and he practiced as a master mechanic for more than five years. He has been solving automotive problems for more than fifteen years. He has expertise in the fields of engines, emissions control devices, automatic and manual transmissions, brakes, steering and suspension systems, HVAC systems, electrical and computer systems, driveability and best practices and procedures for automotive repair. He has performed smog related inspections and repairs in the state of California. He consults and performs investigations relating to best practices and standard of care issues in the field of automotive service and repair.

Prior to joining Exponent, Dr. Lillo completed his B.S. (U.C. Berkeley), M.S and Ph.D. (University of Michigan - Ann Arbor) in Mechanical Engineering. While at the University of Michigan, he used advanced laser based optical diagnostics to study flame, airflow and fuel spray development inside automotive engines. He has also worked in combustion laboratories at both Sandia National Laboratories and UC Berkeley.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Michigan, Ann Arbor, 2016

M.S., Mechanical Engineering, University of Michigan, Ann Arbor, 2013

B.S., Mechanical Engineering, University of California, Berkeley, 2010

A.S., Engine Machining and Service, De Anza College, 2005

A.S., Automotive Engine Performance, De Anza College, 2005

A.S., Automotive Chassis Systems, De Anza College, 2005

Graduate Research Fellowship, National Science Foundation, 2011-2014

Alternate Member: Technical Committee on Automotive and Marine Service Stations (AUV-AAA), NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages, National Fire Protection Association , 2018-present

Alternate Member: Technical Committee on Internal Combustion Engines (INT-AAA), NFPA 37 Standard for the Installation and Use of Stationary Engines and Gas Turbines, National Fire Protection Association, 2017-present

Licenses and Certifications

Licensed Professional Mechanical Engineer, California, #39287

ASE Master Certified Automobile Technician and Advanced Level Engine Performance Specialist, #1410-6834

Hazardous Waste Operations and Emergency Response Training, 29 CFR 1910.120

Fire Investigation: Cause and Origin Determination (1A), accredited by the California State Fire Marshall

Certified Vehicle Fire Investigator (CVFI), NAFI No. 22106-12680v

Certified Fire and Explosion Investigator, NAFI No. 22106-12680v

Prior Experience

Graduate Student Researcher, Quantitative Laser Diagnostics Laboratory, University of Michigan, 2011-2016

Combustion Research Intern, Sandia National Laboratories, 2010-2011

Student Researcher, Combustion Analysis Laboratory, University of California, Berkeley, 2008-2010

Master Automotive Technician, Dirks Automotive and Transmission Repair, Oroville, CA, 2006-2007

Master Automotive Technician, J.P. Automotive, San Jose, CA, 2002-2006

Professional Affiliations

National Fire Protection Agency

The Combustion Institute

Society of Automotive Engineers

Publications

Lillo PM, Zhuang H, Sick V. Topological development of homogeneous-charge and spray-guided stratified-charge flames in an internal combustion engine. International Journal of Engine Research 2017;

1468087417727192.

Lillo PM. Topological development of homogeneous-charge and stratified-charge flames in an internal combustion engine. Ph.D. dissertation., University of Michigan, 2016.

Chen H, Lillo PM, Sick V. Single-shot 3D imaging of fuel injection in a spark-ignited direct-injected gasoline engine. International Journal of Engine Research in press.

Lillo PM, Greene ML, Sick V. Plenoptic single-shot 3D imaging of in-cylinder fuel spray geometry. Zeitschrift für Physikalische Chemie (Journal of Physical Chemistry), 2015.

Lillo PM, et al. Diesel spray ignition detection and spatial/temporal correction. No. 2012-01-1239. SAE Technical Paper, 2012.

Polonowski CJ, Mueller CJ, Gehrke CR, Bazyn T, Martin GC, Lillo PM. An experimental investigation of low-soot and soot-free combustion strategies in a heavy-duty, single-cylinder, direct-injection, optical diesel engine. (No. 2011-01-1812). SAE Technical Paper, 2011.

Peer Reviewer

Combustion Institute

Society of Automotive Engineers

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Professional Profile

Dr. Senatore's specialized expertise in the area of vehicle engineering includes advanced driver assistance systems (ADAS), vehicle-to-vehicle communications (V2V), automated vehicle technologies, and on-road and off-road vehicle dynamics. Dr. Senatore is an ISO26262 functional safety certified engineer and has participated in Design Failure Mode and Effect Analysis (DFMEA) and Failure Modes Effects and Diagnostic Analysis (FMEDA) for automotive systems. His experience in accident investigations encompass the reconstruction of crashes involving passenger cars and heavy trucks, event data recorder (EDR) and engine control module (ECM) data analysis, automotive testing and simulations of vehicle crashes using the Human Vehicle Environment (HVE) software package. He has published on the topic of the use of ADAS sensor data to reconstruct vehicle crashes, and has conducted experiments to assist in the development of analysis techniques required to analyze such data.

Dr. Senatore's current interests in connected and automated vehicles include accelerated validation, collaborative perception, and the future of EDRs from an accident reconstruction and failure analysis perspective. Dr. Senatore has leveraged his experience in accident investigations to consult with clients on vehicle telematics, conduct reviews of Federal and State vehicle regulations as they apply to automotive products, and analyze vehicle requirements in their development process. His broader project experience includes the development of algorithms for automated vehicles and ADAS perception systems including the development of a patent-pending software algorithm for improving object detection leveraging camera data across multiple vehicles.

Dr. Senatore obtained his Ph.D. in Engineering Mechanics at Virginia Polytechnic Institute and State University. Prior to joining Exponent, Dr. Senatore was a research scientist at MIT, where he collaborated with national agencies, research institutions, and private companies to study how vehicles and robotic systems interact with unstructured environments. In that capacity he developed strategic and tactical tools to support mobility studies for the NASA Mars Science Laboratory (MSL) and Mars Exploration Rover (MER) missions.

Academic Credentials & Professional Honors

Ph.D., Engineering Mechanics, Virginia Polytechnic Institute and State University, 2010

B.S., Mechanical Engineering, Politecnico di Milano, Italy, 2004

Licenses and Certifications

ISO 26262 Functional Safety Engineer

Prior Experience

Research Scientist, MIT, 2013-2014

Postdoctoral Associate, MIT, 2010-2012

Research Assistant, Virginia Tech, 2008-2010

Professional Affiliations

American Society of Mechanical Engineers — ASME

Society of Automotive Engineers — SAE

Languages

Italian

Patents

US Application No 15/997,750 filed on 6/5/2018: Sensor system for multiple perspective sensor data sets. Inventor: Bin Cheng, Gaurav Bansal, Ryan Matthew Yee, Ellick Ming Huen Chan, Carmine Senatore.

Publications

Yee R, Chan E, Senatore C, Cheng B, Bansal G. Collaborative Perception for Automated Vehicles Leveraging Vehicle-To-Vehicle Communications. Proceedings of the 2018 IEEE Intelligent Vehicles Symposium, June 2018.

Harrington R, Senatore C, Scanlon J, Yee R, "The Role of Infrastructure in an Automated Vehicle Future", The Bridge - National Academy of Engineering, Volume 48 Issue 2, June 15, 2018.

Lange R, Kelly S, Senatore C, Wilson J, Yee R, Harrington R, "Data requirements for post-crash analyses of collisions involving collision avoidance technology equipped, automated, and connected vehicles", ESV 17-0338, June 2017.

Jason P. Marshall, Ryan C. Hurley, Dan Arthur, Ivan Vlahinic, Carmine Senatore, Karl Iagnemma, Brian Trease, José E. Andrade, "Failures in sand in reduced gravity environments", Journal of the Mechanics and Physics of Solids, Volume 113, 2018. https://doi.org/10.1016/j.jmps.2018.01.005

James Slonaker, D. Carrington Motley, Qiong Zhang, Stephen Townsend, Carmine Senatore, Karl Iagnemma, and Ken Kamrin, "General scaling relations for locomotion in granular media", Phys. Rev. E 95, 052901 - Published 10 May 2017 https://journals.aps.org/pre/abstract/10.1103/PhysRevE.95.052901

Jason P. Marshall, Ryan C. Hurley, Dan Arthur, Ivan Vlahinic, Carmine Senatore, Karl Iagnemma, Brian Trease, José E. Andrade, "Analysis of Shear Bands in Sand Under Reduced Gravity Conditions", In: Papamichos E., Papanastasiou P., Pasternak E., Dyskin A. (eds) Bifurcation and Degradation of Geomaterials with Engineering Applications. IWBDG 2017. Springer Series in Geomechanics and Geoengineering. Springer, Cham https://link.springr.com/chapter/10.1007/978-3-319-56397-8_63

Zolock, J., Senatore, C., Yee, R., Larson, R. et al., "The Use of Stationary Object Radar Sensor Data from Advanced Driver Assistance Systems (ADAS) in Accident Reconstruction," SAE Technical Paper 2016-01-1465, 2016, doi:10.4271/2016-01-1465.

J. B. Johnson, A. V. Kulchitsky, P. Duvoy, K. Iagnemma, C. Senatore, R. E. Arvidson, J. Moore, Discrete element method simulations of Mars Exploration Rover wheel performance, Journal of Terramechanics, Volume 62, December 2015, Pages 31-40

J.Y. Wong, C. Senatore, P. Jayakumar, K. Iagnemma, Predicting mobility performance of a small, lightweight track system using the computer-aided method NTVPM, Journal of Terramechanics, Volume 61, October 2015, Pages 23-32.

S. Ozaki, K. Hinata, C. Senatore, K. Iagnemma, Finite element analysis of periodic ripple formation under rigid wheels, Journal of Terramechanics, Volume 61, October 2015, Pages 11-22

Yee RM, Senatore C. Advanced driver assistance systems and connected vehicles: Current technology and future trends. Michigan Defense Trial Counsel E-Letter 2015; 5(3).

Senatore C, Stein N, Zhou F, Bennett K, Arvidson R, Trease B, Lindemann R, Bellutta P, Heverly P, Iagnemma‎ K. Modeling and validation of mobility characteristics of the Mars Science Laboratory Curiosity rover. International Symposium of Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS), Montreal, Canada, June 2014.

Senatore C, Iagnemma K. Analysis of stress distributions under lightweight wheeled vehicles. Journal of Terramechanics 2014 Feb; 51:1-17. ISSN 0022-4898, http://dx.doi.org/10.1016/j.jterra.2013.10.003.

Senatore C, Wulfmeier M, Vlahinich I, Andrade J, Iagnemma K. Design and implementation of a particle image velocimetry method for analysis of running gear-soil interaction. Journal of Terramechanics 2013 Oct-Dec; 50(5-6):311-326. ISSN 0022-4898, http://dx.doi.org/10.1016/j.jterra.2013.09.004.

Zhou F, Arvidson R, Bennet K, Trease B, Lindemann R, Iagnemma K, Senatore C, Bellutta P. Simulations of Mars Rover Traverses. Journal of Field Robotics 2014; 31(1). http://dx.doi.org/10.1002/rob.21483.

Senatore C, Jayakumar P, Iagnemma K. Experimental study of lightweight tracked vehicle performance on dry granular materials. 7th Americas Regional Conference of the ISTVS, Tampa, FL, November 4-7, 2013.

Smith W, Melanz D, Senatore C, Iagnemma K, Peng H. Comparison of DEM and traditional modeling methods for simulating steady-state wheel-terrain interaction for small vehicles. 7th Americas Regional Conference of the ISTVS, Tampa, FL, November 4-7, 2013.

Jayakumar P, Melanz D, Maclennan J, Senatore C, Iagnemma K. Stochastic modeling and uncertainty cascade of soil bearing and shearing characteristics for light-weight vehicle applications. 7th Americas Regional Conference of the ISTVS, Tampa, FL, November 4-7, 2013.

Senatore C, Jayakumar P, Maclennan J, Iagnemma K. Investigation of stress and failure in granular soils for lightweight robotic vehicle applications. Proceedings, Ground Vehicle Systems Engineering and Technology Symposium, Troy, MI, August 2012. Best conference paper award.

Senatore C, Iagnemma K. Direct shear behavior of dry, granular soils for low normal stress with application to lightweight robotic vehicle modelling. Proceedings, International Symposium of the International Society of Terrain-Vehicle Systems, Blacksburg, VA, 2011.

Senatore C, Sandu C. Torque distribution influence on tractive efficiency and mobility of off-road wheeled vehicles. Journal of Terramechanics 2011 Oct; 48(5):372-383.

Senatore C, Sandu C. Off-road tire modeling and the multi-pass effect for vehicle dynamics simulation.

Journal of Terramechanics 2011 Oct; 48(4):265-276.

Iagnemma K, Senatore C, Trease B, Arvidson R, Shaw A, Zhou F, Van Dyke, L, Lindemann R. Terramechanics modeling of Mars Surface Exploration rovers for simulation and parameter estimation. Proceedings, ASME International Design Engineering Technical Conference, 2011.

Trease B, Arvidson R, Lindemann R, Bennett K, Zhou F, Iagnemma K, Senatore C, Van Dyke L. Dynamic modeling and soil mechanics for path planning of Mars Exploration Rovers. Proceedings, ASME International Design Engineering Technical Conference, 2011.

Senatore C, Sandu C. Off-road vehicle mobility and energy efficiency Prediction, 9th Asia-Pacific Conference of the ISTVS, Sapporo, Japan, September 2010.

Senatore C, Ross SD. Detection and characterization of transport barriers in complex flows via ridge extraction of the finite time Lyapunov exponent field. International Journal of Numerical Methods in Engineering 2010 Dec, 10.1002/nme.3101.

Ross SD, Tanaka ML, Senatore C. Detecting dynamical boundaries from kinematic data in biomechanics. Chaos: An Interdisciplinary Journal of Nonlinear Science 2010; 20:017507.

Senatore C, Sandu C. Exit angle influence on energy efficiency of off-road tires. 11th European Regional Conference of the ISTVS, Bremen, Germany, October 2009.

Senatore C, Ross SD. Fuel-efficient navigation in complex flows. Proceedings, 2008 American Control Conference, pp.12441248, 2008.

Presentations

Senatore C. "Automated Vehicles: Current Landscape and Future Directions". 13th International Conference on Multibody Systems, Nonlinear Dynamics, and Control (MSNDC), Special Session Keynote Presentation, Cleveland, OH, August 8 2017

Senatore C. "Future EDR for Automated Vehicles", SAE 2016 FROM ADAS TO AUTOMATED DRIVING SYMPOSIUM, Munich, Germany, November 30, 2016

Senatore C. "Sensor Redundancy and Next-Gen Event Data Recorders From a Failure Analysis Perspective", SAE Government Industry Meeting, Washington D.C., January 21, 2016

Senatore C, Iagnemma K. "Terramechanics and mobility research". Invited Talk, Tank Automotive Research Development and Engineering Center (TARDEC), Warren, MI, June 13, 2013.

Senatore C, Iagnemma K. Terramechanics and mobility research. Invited Talk, Tank Automotive Research Development and Engineering Center (TARDEC), Warren, MI, June 13, 2013.

Peer Reviewer

Journal of Terrmechanics

Journal of Field Robotics

Society of Automotive Engineers Technical Publications

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Professional Profile

Dr. Parker specializes in understanding how composition and formulation affect the performance of complex chemical systems and practical materials. She consults in the areas of fuel, oil, and lubricant formulations as well as friction and wear (tribology) issues in automotive and industrial applications. In addition, she has experience assessing the suitability of polymeric materials and coatings specified for use in medical devices, architectural and construction applications, and other products. Dr. Parker's research interests also include the synthesis and design of organic molecules and metal catalysts commonly used in the production of reinforced plastics and composite materials, inks and coatings, elastomers, and fine chemicals.

Dr. Parker investigates the end-use performance of engine and machine lubricant formulations (oils and greases) and fuels, including marine fuels, gasoline, diesel fuel, and biofuels. During those investigations, Dr. Parker has utilized a variety of methods, such as Fourier-transform Infrared spectroscopy (FTIR), gas chromatography-mass spectrometry (GC-MS), two-dimensional gas chromatography-mass spectrometry (GCxGC-MS), as well as various elemental analysis and specialized chemical analysis methods. Dr. Parker is well-versed in ASTM and ISO methods for lubricant and fuel characterization including rheological and tribological testing. She is also familiar with surface characterization, profilometry, and microscopy techniques.

Dr. Parker has also worked in the area of polymeric materials and coatings, specializing in the interaction of material and coating formulations with their environments. Her experience includes the characterization and assessment of equilibrium processes such as absorption and off-gassing, as well as exposure to environmental stressors such as UV irradiation, temperature, and humidity. Dr. Parker has also consulted for parties involved in intellectual property disputes related to polymeric materials, including trade secret and patent litigation.

Prior to joining Exponent, Dr. Parker was a Senior Researcher at ExxonMobil Research & Engineering. In that role she developed new formulations for commercial vehicle (heavy-duty) engine oils and greases to meet API, ACEA, and automotive engine manufacturer specifications using a combination of industry standard bench tests, stationary fired-engine test stands, and field test programs. She investigated new additives for lubricant applications including novel antioxidants, anti-wear additives, pour-point depressants, dispersants, and friction modifiers, and has contributed to patent applications related to this work. In addition, Dr. Parker provided failure analysis and lubricant product support to lubricant blenders, vehicle manufacturers, and end customers in the transportation, mining, construction, and agriculture industries. She was also involved in the technical validation and global deployment of new components and formulations with impact on product claims and specifications, the global supply chain, and product registration with foreign governments.

Academic Credentials & Professional Honors

Ph.D., Chemistry, Harvard University, 2014

B.A., Chemistry, Grinnell College, 2007

National Science Foundation Graduate Research Fellow, 2009-2012

Thomas J. Watson Fellow, 2007-2008

Archibald Prize for Highest Scholarship, Grinnell College, 2007

Chemistry Alumni Prize, Grinnell College, 2007

Barry M. Goldwater Scholar, 2005-2007

Trustee Honor Scholarship, Grinnell College, 2003-2007

Prior Experience

Senior Researcher, Industrial Lubricants & Greases, ExxonMobil Research & Engineering, 2016

Senior Researcher, Commercial Vehicle Lubricants, ExxonMobil Research & Engineering, 2014-2016

Professional Affiliations

American Chemical Society

Patents

US Patent Application US 61/772,218: 1,2-Hydrosilylation of dienes, Patent Pending. March 2014 (with Ritter T).

Publications

Lee H, Campbell MG, Hernández Sánchez R, Börgel J, Raynaud J, Parker SE, Ritter T. Mechanistic insight into high-spin iron(I)-catalyzed butadiene dimerization. Organometallics 2016; 35: 2923-2929.

Parker SE, Börgel J, Ritter T. 1,2-Selective hydrosilylation of conjugated dienes. Journal of the American Chemical Society 2014; 136: 4857-4861.

Presentations

Parker SE, Ritter T. 1,2-Hydrosilylation of 1,3-dienes at a cyclometallated platinum catalyst. Oral presentation, Organometallic Chemistry Gordon Research Seminar, Newport, RI, 2013.

Parker SE, Ritter T. Selective 1,2-hydrosilylation of butadiene at a cyclometallated platinum-phosphine catalyst. Poster presentation, Inorganic Chemistry Gordon Research Conference, Galveston, TX, 2013.

Parker SE, Börgel J, Ritter T. Platinum-catalyzed 1,2-hydrosilylation of butadiene. Oral presentation, Boston Women in Chemistry Symposium, Boston, MA, 2013.

Parker SE, Ritter T. Platinum-catalyzed 1,2-hydrosilylation of butadiene. Poster presentation, Boston Women in Chemistry Symposium, Boston, MA, 2012.

Mobley TA, Parker SE. Synthesis and conformational characterization of Cp2WHSn(CN)Ph2. Poster presentation, American Chemical Society National Meeting, Chicago, IL, 2007.

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Professional Profile

Ms. Danthurthi has engineering experience which includes the design of automotive and agricultural equipment and development of virtual and physical Anthropomorphic Test Devices (ATDs) for use in automotive safety. Her experience in the automotive field includes development of crash simulations in the context of crashworthiness for design development, and performance in relation to the Federal Motor Vehicle Safety Standards (FMVSS). She has analyzed and tested large scale agricultural equipment for purpose of durability and reliability. She also has experience with current and next generation ATD physical testing, and numerical model construction and validation.

Her work has emphasized study in the areas of structural design optimization, ATD modeling, and component and full-scale testing of vehicles, agricultural equipment and ATDs. Ms. Danthurthi's finite element experience includes analysis of vehicle structures and ATDs using LS-DYNA codes to perform quasi-static, dynamic, and nonlinear simulations.

Prior to joining Exponent, Ms. Danthurthi worked for Humanetics Innovative Solutions as a Project Engineer, where she performed ATD simulations such as head drop, neck flexion and extension, and, shoulder, lumbar and thorax pendulum tests. These analyses resulted in the development of adult and child biofidelic virtual models of crash test dummies for use in automotive safety. She was also involved in abdomen twin pressure model simulation of child dummies to assist in the evaluation of abdominal injuries in children during a vehicle crash.

She has prior experience working at CNH Industrial Case IH with field testing of agricultural tillage equipment, and design and optimization of the structures using numerical simulation to achieve light weight equipment that is also durable and reliable. She has used fatigue analysis software to analyze strain gauge data from machines during field tests to characterize the operating environment. Using this load data, designs were optimized through finite element analysis to predict their response in field conditions.

Academic Credentials & Professional Honors

M.S., Mechanical Engineering, University of Michigan, Ann Arbor, 2010

B.E., Mechanical Engineering, Osmania University, India, 2008

Licenses and Certifications

Certified Child Passenger Safety (CPS) Technician, #T777489

Prior Experience

CAE - Project Engineer, Humanetics Innovative Solutions, 2015-2017

Structural Analyst, Case IH at CNH Industrial, 2013-2015

CAE - Vehicle Safety Engineer, Chrysler LLC, 2011-2013

Professional Affiliations

Society of Automotive Engineers, Associate Member — SAE

American Society of Mechanical Engineers — ASME

Languages

Hindi

Telugu

Publications

Filatov A., Scanlon J.M., Bruno A., Danthurthi S.S.K., Fisher J. “Effects of innovation in automated vehicles on occupant compartment designs, evaluation, and safety: A review of public marketing, literature, and standards.” SAE Technical Paper (2019-01-1223), 2019.

Ravinder Reddy P, Rama Lakshmi P, Padmaja, Kameshwari DSS, Arundeep J. Investigation of SIF and J-Integrals in composite plates with cracks. Recent Advances in Materials, Processing and Characterization. National Journal of Technology, 2008.

Public Abstracts of Presentations

Zolock J, Danthurthi S, Use of Computer Simulation in Litigation — with emphasis on Vehicles, Humans, and Structures, Maryland Defense Counsel, May 17, 2018.

Additional Education & Training

Engineering Dynamics Corporation HVE Forum Workshop, February 2020

Bosch Crash Data Retrieval (CDR) Tool Technician Training, IPTM, 2019

Northwestern University Center for Public Safety Traffic Accident Reconstruction Course, July 2018.

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Professional Profile

Dr. Anderson applies mechanical and chemical engineering principles to solve clients' complex technical problems across a broad range of industries, including consumer products, textiles, manufacturing, industrial chemical processes, heating and cooling systems, and heavy earthmoving equipment. Dr. Anderson specializes in accident evaluation and prevention, failure analysis, fire and explosion investigation and analysis, industrial process evaluation, product development and validation, and intellectual property disputes. He has both academic training and industry experience in the design, analysis, and validation of thermal systems; in modeling complex systems involving simultaneous species transport, chemical reaction, and heat transfer; in experimental instrumentation and data acquisition; and in design, manufacturing, and field support of heavy construction equipment.

Prior to joining Exponent, Dr. Anderson completed a Ph.D. in Mechanical Engineering at the Georgia Institute of Technology. In his doctoral dissertation research, Dr. Anderson developed a novel reaction-separation approach to low temperature hydrogen production via the steam methane reforming process with in situ carbon dioxide capture. He also completed a thesis-based M.S. degree at Georgia Institute of Technology, investigating the use of nanostructured surfaces with patterned gradients in surface energy and wettability to enhance the rate of condensation heat transfer. During his tenure as a graduate research assistant, Dr. Anderson conducted research as a visiting scholar in the Center for Energy Technology at RTI International and in the Thermal Sciences Division of Air Force Research Laboratory. He participated in the Sam Nunn Security Fellows Program, where he explored the public policy and energy security dimensions of the recent surge in domestic shale gas production. He also held a fellowship in Paper Science and Engineering, developing expertise in pulp and paper manufacturing processes.

Before his graduate studies, Dr. Anderson worked for 5 years as a machine cooling system design and development engineer for Caterpillar, Inc. on a variety of products including skid steer loaders, backhoe loaders and track-type tractors. While at Caterpillar, he developed both active and passive cooling systems, including demand-based fan speed algorithms, oil cooling of hydraulic implements and drive transmissions, underhood thermal management of exhaust after-treatment components, and radiators and turbocharger aftercoolers for engine systems. He was involved in all phases of the design process, ranging from conceptualization to performance modeling to prototype design/fabrication to testing/validation. Dr. Anderson is certified by Caterpillar as a Six Sigma Green Belt and has applied that skill to numerous Six Sigma projects involving Failure Mode and Effects Analysis (FMEA), Design of Experiments (DOE), and Design for Six Sigma (DFSS).

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Georgia Institute of Technology (Georgia Tech), 2015

M.S., Mechanical Engineering, Georgia Institute of Technology (Georgia Tech), 2013

B.S., Mechanical Engineering, North Carolina State University, *summa cum laude*, 2005

Georgia Institute of Technology Leadership Fellow, 2013-2015

Sam Nunn Security Fellow, 2013

National Defense Science and Engineering Graduate Fellowship, 2012

IPST Paper Science and Engineering Fellowship, 2011

G.W. Woodruff School of Mechanical Engineering Presidents' Fellowship, 2010

North Carolina State University John T. Caldwell Scholarship, 2001

Licenses and Certifications

Licensed Professional Engineer, Georgia, #PE041588

Certified Fire and Explosion Investigator, #20958-12905

Six Sigma Green Belt

Certified LabVIEW Associate Developer

Prior Experience

Graduate Research Assistant, Georgia Institute of Technology, 2010-2015

Freshman Grand Challenges Facilitator, Georgia Institute of Technology, 2014-2015

Visiting Researcher, RTI International, 2013

Visiting Researcher, Air Force Research Laboratory, 2011

Product Development Engineer, Caterpillar Inc., 2005-2010

Professional Affiliations

American Society of Mechanical Engineers — ASME (member)

American Institute of Chemical Engineers — AIChE (member)

National Association of Fire Investigators — NAFI (member)

Patents

U.S. Patent No. 20,150,274,524: Reactor for Steam Reforming and Methods of Use Thereof, October 1, 2015 (with AG Fedorov).

U.S. Patent Application No. 61/738,580: Sorption-enhanced CHAMP reactors for distributed fuel processing and power generation with integrated CO2 capture, filed 12/18/2012 (Anderson DM, Fedorov AG).

Publications

Anderson DM, Fessler JR, Pooley MA, Seidel S, Hamblin MR, Beckham HW, Brennan JB. Infrared radiative properties and thermal modeling of ceramic-embedded textile fabrics. Biomedical Optics Express 2017; 8(3):1698-1711.

Anderson DM, Yun TM, Kottke PA, Fedorov AG. Comprehensive analysis of sorption enhanced steam methane reforming in a variable volume membrane reactor. Industrial & Engineering Chemistry Research 2017; 56(7):1758-1771.

Pooley, MA, Anderson DM, Beckham HW, Brennan JB. Engineered emissivity of textile fabrics by the inclusion of ceramic particles. Optics Express 2016; 24(10):10556-10564.

Anderson DM, Nasr MH, Yun TM, Kottke PA, Fedorov AG. Sorption-enhanced variable-volume batch-membrane steam methane reforming at low temperature: Experimental demonstration and kinetic modeling. Industrial & Engineering Chemistry Research 2015; 54(34):8422-8436.

Yun TM, Kottke PA, Anderson DM, Fedorov AG. Theoretical analysis of hydrogen production by variable volume membrane batch reactors with direct liquid fuel injection. International Journal of Hydrogen Energy 2015; 40(25):8005-8019.

Yun TM, Kottke PA, Anderson DM, Fedorov AG. Experimental investigation of hydrogen production by variable volume membrane batch reactors with modulated liquid fuel introduction. International Journal of Hydrogen Energy 2015; 40(6):2601-2612.

Yun TM, Kottke PA, Anderson DM, Fedorov AG. Power density assessment of variable volume batch reactors for hydrogen production with dynamically modulated fuel introduction. Industrial & Engineering Chemistry Research 2014; 53(47):18140-18151.

Anderson DM, Kottke PA, Fedorov AG. Thermodynamic analysis of hydrogen production via sorption-enhanced steam methane reforming in a new class of variable volume batch-membrane reactor. International Journal of Hydrogen Energy 2014; 39(31):17985-17997.

Gittens RA, Olivares-Navarrete R, Cheng A, Anderson DM, McLachlan T, Stephan I, Fedorov AG, Rupp F, Geis-Gerstorfer J, Sandhage KH, Boyan BD, Schwartz Z. The role of titanium surface micro/nanotopography and wettability on the differential response of human osteoblast lineage cells. Acta Biomaterialia 2013; 9(4):6268-6277.

Anderson DM, Gupta MK, Voevodin AA, Hunter CN, Putnam SA, Tsukruk VV, Fedorov AG. Using amphiphilic nanostructures to enable long-range coalescence and surface rejuvenation in dropwise condensation. ACS Nano 2012; 6(4):3262-3268.

Proceedings and Presentations

O'Hern SC, Stern MC, Anderson DM, Ibarreta A, Myers TJ. Analysis of combustible dust flash fires on personal protective equipment. Proceedings, Hazards 27, Institute of Chemical Engineers, Birmingham, UK, May 2017.

Anderson DM. Heat Transfer in Textiles: Using fundamental principles to design better products. Industrial Fabrics Association International Expo 2016, Charlotte NC, October 2016.

Anderson DM. Textiles and radiant heat: facts and misconceptions. American Association of Textile Chemists and Colorists Spring Meeting, May 2016.

Morrison DR, Anderson DM, Smyth SA, Hetrick TM. Understanding the fire risks of eCigarettes, vapes,

and mods. Proceedings, DRI Product Liability Conference, New Orleans, LA, February 2016.

Anderson DM, Nasr MH, Yun, TM, Kottke PA, Fedorov AG. Sorption-enhanced CHAMP reactor for distributed steam methane reforming. 3rd International Education Forum on Environment and Energy Science, Perth, Australia, December 2014.

Anderson DM, Kottke PA, Yun TM, Fedorov AG. Sorption-enhanced variable volume membrane reactor for hydrogen production from methane: modeling and experimental characterization. 2014 AIChE Annual Meeting, Atlanta, GA, November 2014.

Anderson DM, Kottke PA, Fedorov AG. Sorption-enhanced CHAMP class reactor for low temperature, distributed hydrogen production from natural gas. 2nd International Education Forum on Environment and Energy Science, Huntington Beach, CA, December 2013.

Anderson DM, Kottke PA, Fedorov AG. Hydrogen production from natural gas via sorption-enhanced variable volume batch-membrane reactors. 2013 AIChE Annual Meeting, San Francisco, CA, November 2013.

Anderson DM, Fedorov AG. Improved CHAMP-class reactors enabling a sustainable route to hydrocarbon processing for mobile and distributed power generation. 1st International Education Forum on Environment and Energy Science, Waikoloa, HI, December 2012.

Kottke PA, Anderson DM, Fedorov AG. Condensation enhancement with micro and nano-structured amphiphilic surfaces. 2012 Power MEMS Workshop, Atlanta, GA, December 2012.

Anderson DM, Gupta MK, Voevodin AA, Hunter CN, Putnam SA, Tsukruk VV, Fedorov AG. Mechanisms of condensation on amphiphilic nanostructured surfaces. ASME 3rd Micro/Nanoscale Heat & Mass Transfer International Conference, Atlanta, GA, March 2012.

Anderson DM, Gupta MK, Voevodin AA, Hunter CN, Putnam SA, Tsukruk VV, Fedorov AG. Controlling water condensation in energy systems using nanostructured surfaces. 4th International Forum on Multidisciplinary Research and Education in Energy Sciences, Honolulu, HI, December 2011.